Jameco ELECTRONICS

JE232CM

RS-232C ADAPTER for COMMODORE 64 and VIC-20

USER'S MANUAL

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This manual is intended for users of the **Jameco Electronics JE232CM RS-232 Adapter** for Commodore* 64 and VIC-20. These pages describe installation and use of the JE232CM with most RS-232 devices.

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2nd EDITION MAY 1984

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Introduction

The JE232CM is an RS-232C adapter for use with Commodore 64 and VIC-20 computers. It makes all physical and electrical conversions for connection to standard RS-232 peripherals. It is fully compatible with Commodore's internal software as well as the "VICTERM" and "64 TERM" programs available from Commodore.

The JE232CM implements four of the most commonly used control lines of the RS-232 interface. Two of these are for input and two for output. All may be inverted.

The JE232CM configures the port as Data Communication Equipment (DCE). It should be connected to Data Terminal Equipment (DTE) devices with a straight through cable (1-1, 2-2. etc.). For connection to DCE devices, use a NULL-MODEM cable (2-3, 3-2, etc.).

JE232CM PIN OUT

PIN NO.	LINE	NAME
2	INPUT	RECEIVED DATA
3	OUTPUT	TRANSMITTED DATA
4	INPUT	CLEAR TO SEND
5	OUTPUT	REQUEST TO SEND
6	OUTPUT	DATA TERM. READY
7	----	GROUND
20	INPUT	DATA SET READY

NOTE: THESE ARE STD. EIA PINOUTS FOR DCE PORTS.

Setting the DIP Switches

The JE232CM has four DIP switches that are used to invert the four control lines (CTS, RTS, DTR, DSR) of the RS-232C interface. This may be necessary for proper handshaking between the JE232CM and your RS-232 device.

The switches are defined as follows:

Switch Number	Signal Name	RS-232 Pin No.	User Port Pin No.
1	CTS – Clear To Send	4	K and H
2	RTS – Request To Send	5	D
3	DTR – Data Terminal Ready	6	E
4	DSR – Data Set Ready	20	L

When the switches are in the ON position their lines are non-inverted. They are inverted in the OFF position.

The proper settings for the switches will depend on the equipment that you are connecting. Any number of the control lines may be used by the RS-232 device. Consult the user's manual of the equipment you are connecting and try each combination of the switches until the device operates properly. Improper switch settings will not hurt any of the equipment. The most common setting for the switches is either all ON or all OFF. Try these combinations first.

If you are using Xon/Xoff handshaking you will not have to set the switches at all. Xon/Xoff works on many RS-232 devices and only requires a 3 wire cable.

Opening the RS-232 Channel

In order to use the RS-232 channel you must first OPEN it. Only one RS-232 channel should be open at any time. Opening a second channel will reset the buffer pointers and discard any data already in the buffers.

The basic syntax for OPENing a channel is:

OPEN <file-num>,2,0,CHR$(<control register>)+CHR$(<command register>)[+CHR$(<baud low>)+CHR$(<baud high>)]

where:

<file-num> can be any number from 1 to 255. If the file number is greater than 127 then a line feed will automatically follow all carriage returns.

<control register> determines the number of bits and the baud rate. The control register is detailed in table 1. The value of the control register should be determined by adding up the value of the bits in table 1 as determined by the specifications of your RS-232 device.

<command register> determines the parity, duplex and handshaking of the RS-232 interface. It is detailed in table 2. The value of the command register will also be determined by the characteristics of the RS-232 device to be connected.

<baud low> & <baud high> are optional on the Commodore 64 and are explained in table 1.

Opening the RS-232 channel will cause two buffers to be set up; one for input and one for output. These buffers are 256 bytes each or 512 bytes total and are necessary for proper operation. If there is not enough free space the end of your program will be destroyed.

The allocation of the buffers causes the system to perform a CLR which will clear any variables or arrays existing at the time. It is definitely a good idea to OPEN the RS-232 channel at the beginning of your program before you do anything else.

Sending Data to the Channel

There are two ways to send data to the RS-232 channel from BASIC. The first way will switch the primary output device from the screen to the RS-232 channel. Any output from LIST or PRINT statements will be sent to the RS-232 device. The command to accomplish this is

CMD <file-num>

where <file-num> is the number used in the OPEN statement.

To re-direct the output back to the screen

PRINT#<file-num>

NOTE:
Any system error (e.g. ?SYNTAX ERROR) will reset the primary output device to the screen. This will also happen if you perform a warm start with the RUN/STOP and RESTORE keys but with one side effect. The RS-232 channel will remain open but no characters will appear at the JE232CM. The file will have to be CLOSEd and then re-OPENed.

The other way to send data to the channel is the PRINT# command. Anything that may be printed on the screen with a normal PRINT command may be printed to the RS-232 channel with the PRINT# command. The format of the command is

PRINT#<file-num>,<variable list>

When sending data, the output buffer can hold up to 255 characters. If you are sending characters faster than the RS-232 channel can transmit them the buffer will fill up and the computer will wait for space to be available before allowing any more characters.

Getting Data from the Channel

There are two ways to get data from the RS-232 channel. The first is NOT recommended as it is dangerous to use. This is the

INPUT#<file-num>,<variable list>

command which operates similar to the INPUT command. It is dangerous because it waits for a non-null character and a following carriage return. If these are not received the system will freeze in a RESTORE-only state.

The other, much safer way to get data is the

GET#<file-num>,<string variable>

command. This command will always return a value in <string variable>. If there is no data in the buffer then a null character (" ") is returned.

If the RS-232 buffer is receiving data faster then it is being processed by your BASIC program the input buffer will fill up. The receiver buffer overrun bit of the status byte will be set and any further characters on the RS-232 channel will be lost during the buffer full condition. As you can see, it is important to keep the buffer as empty as possible.

Closing the RS-232 Channel

The command to close the RS-232 channel is simply

CLOSE <file num>

but be careful! This command will discard any data in the buffers and stop all RS-232 transmitting and receiving. Be sure that all data has been transmitted before CLOSEing the channel. A way to check this from BASIC is

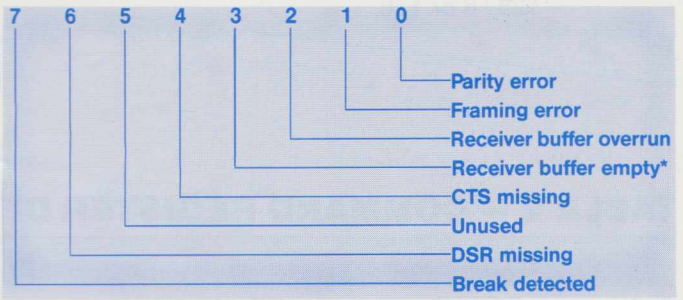
100 IF PEEK (669)<>PEEK(670) THEN 100

This statement will ensure that the output buffer is empty.

Using the RS-232 Status Register

ST is the variable name of the RS-232 status register. It indicates the buffer conditions and any errors. The bits are:

By checking these bits you can determine if there have been any errors. ST is cleared each time it is read so you should assign it to another variable before you use it. The RS-232 status is read from BASIC variable ST only when the RS-232 channel was the last external I/O used.



* Not implemented on the VIC-20

Machine Language Programming

All of the BASIC techniques presented here can be duplicated by machine language Kernal calls. The details of this type of programming is left to other more appropriate texts, several of which are listed below.

References

Commodore 64 Programmer's Reference Guide, Commodore Business Machines, Inc., 1982
VIC REVEALED, Hampshire, Nick, Hayden Book Company, Inc., 1982
VIC-20 RS-232 Interface Cartridge Manual, Commodore Business Machines, Inc., 1982

Installation

To install the JE232CM, simply insert it into the Commodore User Port on the left rear of the computer. Be sure that the power is OFF and that the component side of the JE232CM is up.

(Text continued inside fold)

TABLE 1 – CONTROL REGISTER DETAIL

BIT #	7		6	5	4	3	2	1	0		
	Stop Bits	**Data Bits**								**Baud Rate**	**Note**
	0 - One	8	–	0	0	X	0	0	0	0	User Rate	
	1 - Two	7	–	0	1		0	0	0	1	50 Baud	
		6	–	1	0		0	0	1	0	75	
		5	–	1	1		0	0	1	1	110	
							0	1	0	0	135	
							0	1	0	1	150	
							0	1	1	0	300	
							0	1	1	1	600	
							1	0	0	0	1200	
							1	0	0	1	1800	
							1	0	1	0	2400	
							1	0	1	1	3600	UR
X - Not Used							1	1	0	0	4800	UR

UR – User Rate – 3600 and 4800 baud are not implemented in Commodore's software but may be used for output on the Commodore 64. This is accomplished with the optional <baud low> and <baud high> and with the <control register> baud rate set to User Rate (0000).

Baud Rate	<baud low>	<baud high>
3600	42	0
4800	7	0

Example: The control register value for connection to a device that uses 8 data bits, 2 stop bits, 1200 baud is 128+8 or 136.

TABLE 2 – COMMAND REGISTER DETAIL

BIT #	7	6	5		4		3	2	1	0	
Parity			**Enable**			**Duplex**					**Handshaking**
Odd	0	0	0	Parity disabled	0	Full	X	X	X	0	Xon/Xoff
Even	0	0	1	Parity enabled	1	Half				1	CTS *
Mark	1	0									
Space	1	1									

* The CTS signal is not implemented on the VIC-20 X - Not Used

Example: The command register value for Odd parity, Full duplex, and Xon/Xoff handshaking is 32.

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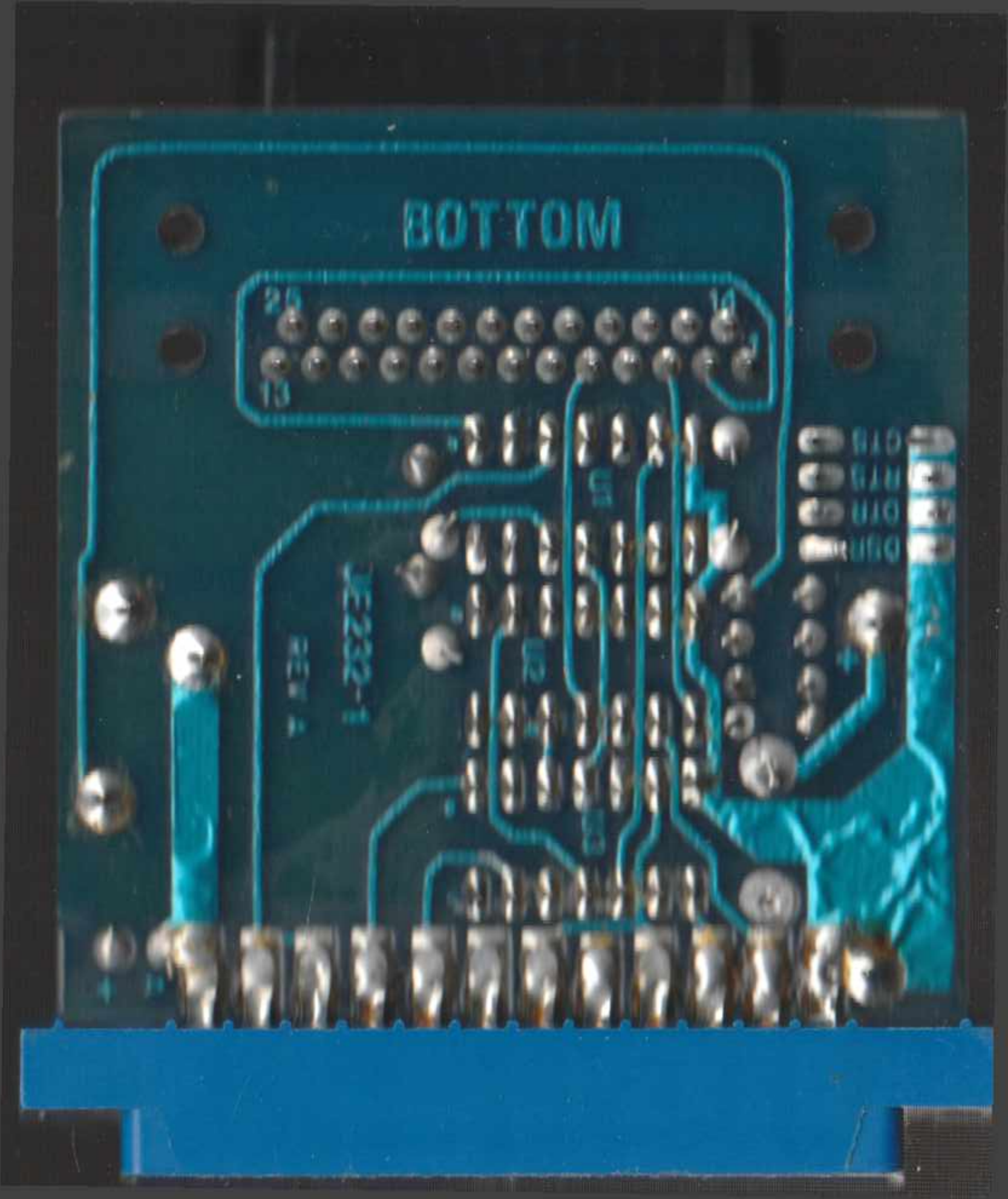
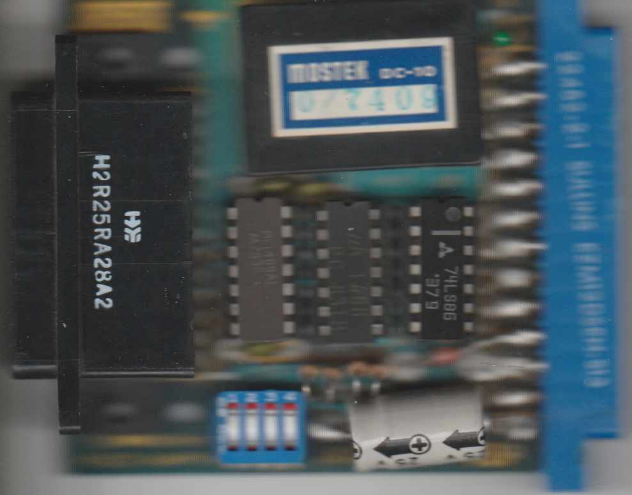
PLEASE PACK SECURELY. WE SUGGEST YOU INSURE THE SHIPMENT.


BOTTOM
25
14
13
1
RS232


MOSTEK
DC-10